

**F** **E** **C** **A** **T** **H** **I** **N** **G** **R** **O** **S**

Interneer will provide access to essential mechanical engineering information and guidelines and will facilitate the capture and deployment of our customers' internally generated engineering knowledge, organization-wide. Through a unique combination of online knowledge, workflow, and community management, Interneer will dramatically increase both efficiency and effectiveness. As a result, the process of mechanical engineering will become far more cost effective, while simultaneously benefiting from an overall increase in quality.

Interneer is delivering an online virtual workspace for engineers to:

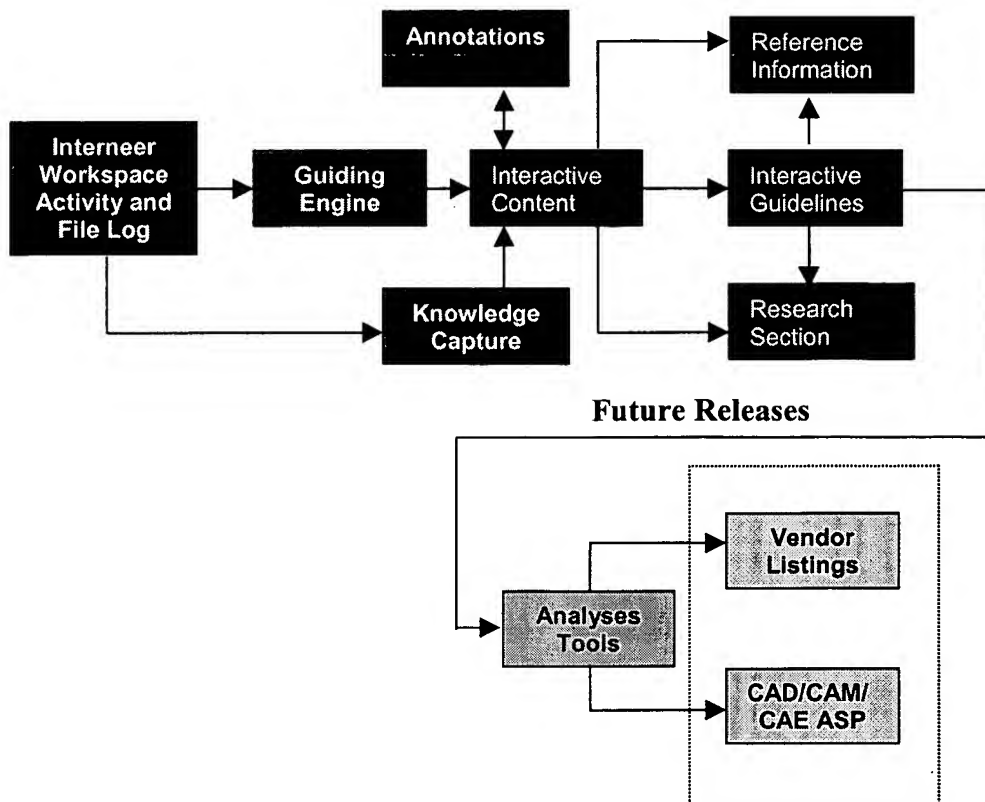
- Search for and interact with design process information and data quickly and efficiently.
- Solve technical problems online following established guidelines and rules of thumb.
- Capture, codify and leverage information, knowledge and processes.

Subscription paying engineers are provided access to the most widely used engineering information, equations and data (retrieved via Interneer's proprietary intelligent and interactive search engine), problem solving tools, and a workflow system creation and deployment tool. Interneer will also provide PDA accessibility, collaboration and will expand into procurement and outsourcing resources, CAD / CAM / FEA server run applications, and educational resources. Based on customer feedback, additional features will be added through development, licensing and partnerships.

## Work Space Navigation

Figure D-1 shows the Interneer Process Diagram. The user logs in to their personalized engineering workspace where they have access to their account information, server files, activity log and all the available tools. Once there, users can deploy the guiding engine to search and browse for the key information they seek, from references to guidelines. The user can also choose to create annotations or capture a workflow. As the engineer works through an engineering workflow, they are able to interact with the content, reference necessary information and conduct analyses in real time. In future releases, Interneer will integrate with vendor databases to provide real time feedback on specified part availability. Also access to tools such as CAD, CAM and CAE will be provided on a fee for use basis. Interneer's software offering is described in detail in the following subsections.

Figure D-1.



### Guiding Search/Browse Engine

Interneer's guiding technology is based on proprietary software that combines the power of keyword searching with the flexibility of browsing. This combined search method allows engineers to reach relevant results more quickly. Interneer dynamically generates browse-able categories based on the search information provided by the user. Engineers are thus able to enter keywords that will be interpreted by the software and be guided to the best solution via multiple layers of dropdown lists. The category list is limited to those relating to the keywords. This allows users to understand how the search is locating the target information needed, so that at any time during the browsing process, the

engineer can quickly change paths (if they realize that they mistook the search definition).

Engineers are able to search Interneer-created and user-submitted, approved guidelines. They can also search through their activity log. The search/browse engine is one of the fundamental ways Interneer will save engineers time, guiding them quickly and efficiently to the knowledge they seek.

The software includes taxonomy searching features. Each taxonomy consists of taxonomy categories and targets, with links between categories and categories, or between categories and targets, which indicate parent/child relationships in the hierarchy. In addition, a target may be associated with zero or more keywords. Multiple taxonomies are supported.

Thus, the taxonomy structure is stored in five database tables:

- taxonomy
- taxonomyCategory
- taxonomyTarget
- taxonomyTargetKeyword
- taxonomyLink

To search a taxonomy, a user enters a one or more keywords and presses "Submit"

The software performs the following search algorithm:

Middleware:

- Retrieve from the database all taxonomy targets associated with the given keywords.
- For each taxonomy target:
  - Call a function to process all parent categories.
  - Within this function:
    - Retrieve from the database all links to parent categories of this target.
    - For each parent link:
      - Call this function recursively to process all parent categories of this category (i.e., at the next higher level).
      - Set link type to indicate a taxonomy root if function result indicates no parents for this category.
      - Store all attributes of this link in a parameters collection.
      - Nest this parameters collection within another parameters collection containing all processed links.
    - Next parent link
  - End function
- Next taxonomy target
- For each processed link in the nested parameters collection generated above
  - Retrieve from the database the name and type of the child category, if the child is a category, or retrieve the child target reference (the thing pointed to by the target -- i.e., process step) if the child is a target.
  - Store this information in memory in an array of link data, with the attributes of child and parent nodes also stored in each link. (Some data stored redundantly for efficiency.)
- Next processed link
- Loop through link data array to convert to XML menu

structure

- Find a link whose parent is a root category not previously processed in this loop.
- Format root category as XML menu element
- Loop through link data array to follow parent/child links from top to bottom
  - Format link data as XML menu structure and append to XML output
  - Continue loop
- Continue loop
- Output XML menu data

ASP script (presentation):

- Call function to process XML menu data generated by middleware and convert to Javascript array expected by third-party menu manager library.
- Within this function:
  - Loop through menu elements at the current level
    - If no menu element has been read, read first menu element, otherwise read next
    - If menu element is the end of a submenu, exit loop.
    - If menu element is the start of a submenu
      - Call this function recursively to process this submenu in the same manner, passing current context to allow sequential processing of XML to continue.
    - If menu element is any other type, convert XML data to javascript array expected by third-party menu manager library.
  - Continue loop
  - Clear benign error code, if any

- Write javascript array data expected by third-party menu manager library.
- End function

User interface:

- User sees a hierarchy of drop-down menus corresponding to all possible routes through the taxonomy hierarchy to targets associated with the keyword the user entered. Since the web structure of the taxonomy is mapped to the tree structure of the menus, targets having multiple paths will appear more than once. (Will appear once for each unique path through the taxonomy.)

#### Interactive Engineering Guidelines and Content with Problem Solving Tools

Interneer will have a database of the most widely used guidelines and "rules of thumb" for engineers along with the necessary equations, data and charts. This content will be generated from popular engineering handbooks available in electronic form. Topics will be compiled from surveys conducted on working engineers and will include:

- Guidelines - Engineering workflows compiled from handbooks, standards, specifications and experts
- Technical content - Concise and structured and offered in layers of increasing detail
- Interactive problem solving tools - Interactive equations and explanations of equations
- Reference information - Charts, graphs, tables, constants,



standards, specifications, material properties etc.

- Research and news - Content from popular engineering journals and headlines

#### Knowledge and Workflow Capture

Interneer provides engineering firms with the ability to also capture their own proprietary processes and guidelines. This way, the knowledge is codified and leveraged, allowing multiple users in an organization to harvest and utilize knowledge that was otherwise only available to the company's experts. This captured knowledge will be available exclusively to them, but will be seamlessly integrated with Interneer's existing knowledge base.

Interneer allows companies to build their own tools and resources and to organize the cumulative knowledge of their engineers. It can then be passed on to new hires and current employees simply and efficiently. Experienced engineers will then be relieved to some extent from training and supervision, allowing them to focus on their core competencies.

#### E-Journal

This feature tracks users' daily work activities and is an essential time saving tool, given that engineers often refer to their previous work. Elements to the log include:

- Tracking application - Dynamically stores user activities as they solve problems
- Real-time save - Saves instances of their work when

selected

- Online log - Record of pages viewed, equations utilized, data input into equations, etc.

#### Annotations

Interneer allows engineers to capture knowledge in the form of annotations that can be attached to every page on the server through an annotation engine. This knowledge, which is embodied in engineers' minds and embedded in the processes they use, is immediately captured as they use Interneer. By capturing and codifying annotations, Interneer ensures that knowledge that was once hard to access is now well leveraged, rapidly updated, and easily accessible.

#### PDA Compatibility

Interneer will create style sheets that are compatible with PDA devices and that will serve HTML pages through the devices' wireless Internet connection. For those users with no wireless Internet connection, mini applications will be made available for download and use on these devices.

#### Collaboration

Interneer will provide an online project management and collaboration environment, selectively allowing project access control, online file storage and tracking of milestones. In addition, engineers on Interneer will be able to interact with each other virtually to access the same pages and share information.

## Future Product Development Plans

Interneer plans to expand its services and functionality by providing real time and online access to suppliers. Upon designing and specifying needed parts, engineers are provided direct access to the providers of these parts as well as experts. As equations are solved online, lists of links to manufacturers of the designed parts are presented along with detailed information, availability / lead-time and cost. Users can purchase needed parts on Interneer.com and directly communicate between their procurement agent and the provider.

Interneer plans to also provide server run applications for Computer Aided Design (CAD), Finite Elements Analyses and Computer Aided Manufacturing (CAM) tools online, available on a pay per use basis. These tools will complete the package making Interneer the complete solution for engineers.

## Content Acquisition Criteria

Interneer is selecting initial content for the product based upon our market research, focus groups, and knowledge of target industry needs. Interneer intends to license content from well-known engineering handbooks in order to establish credibility for the software. To help ensure accuracy, Interneer has developed a quality assurance procedure to double-check entries into databases. Interneer will constantly upgrade content and update processes based on new revisions, technical papers, and industry needs. Users will also be able to add content to Interneer's shared database, after the content has been through our extensive review process.